Toward Lightning RubyVM

RubyKaigi2010 Technical Lightning Talk

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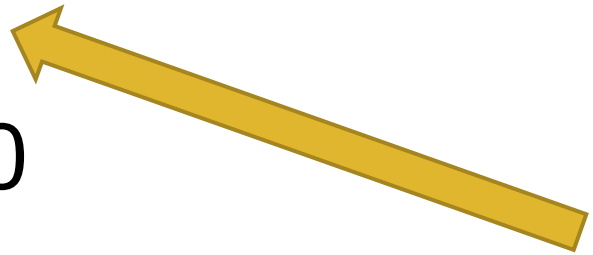
THIS PRESENTATION is about

Peformance of RubyVM

Speed-up, Efficient,
Optimization, …

Our current Challenges in Sasada-Lab (Students task)

- **AOT Compiler**
  - **Ruby to C**
  - Ruby to X10
- Profilers
  - **Memory Profiler**
  - Performance Profiler
- Regexp AOT Compiler
- Atomic-Ruby (for Embedded)
- CI (w/ performance) enviroment



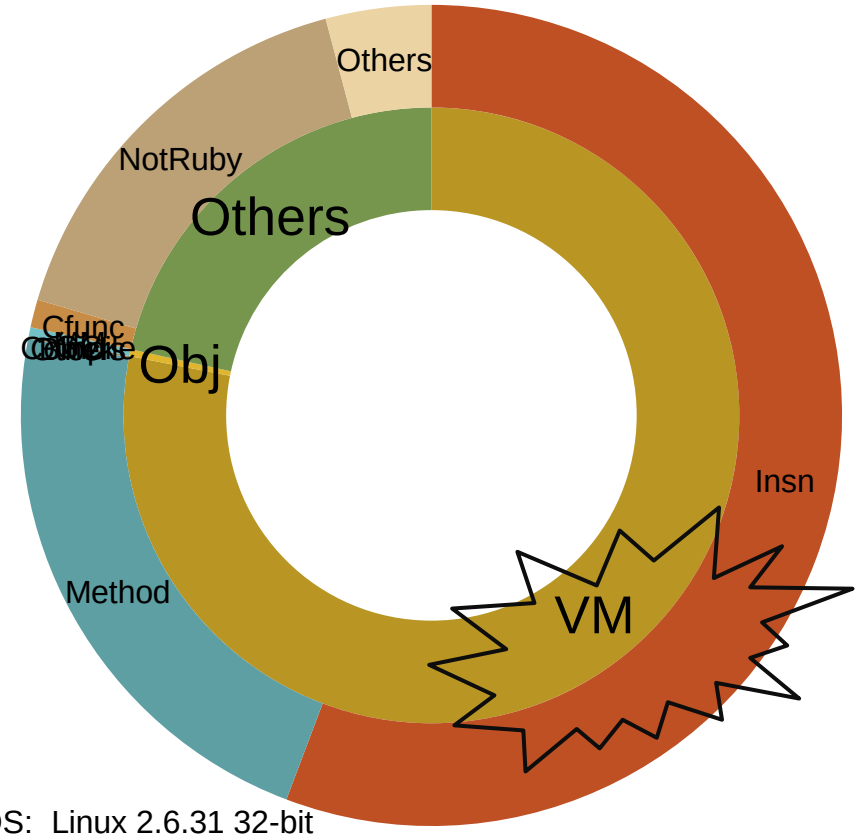
Sessions at Tomorrow Morning

My Challenge

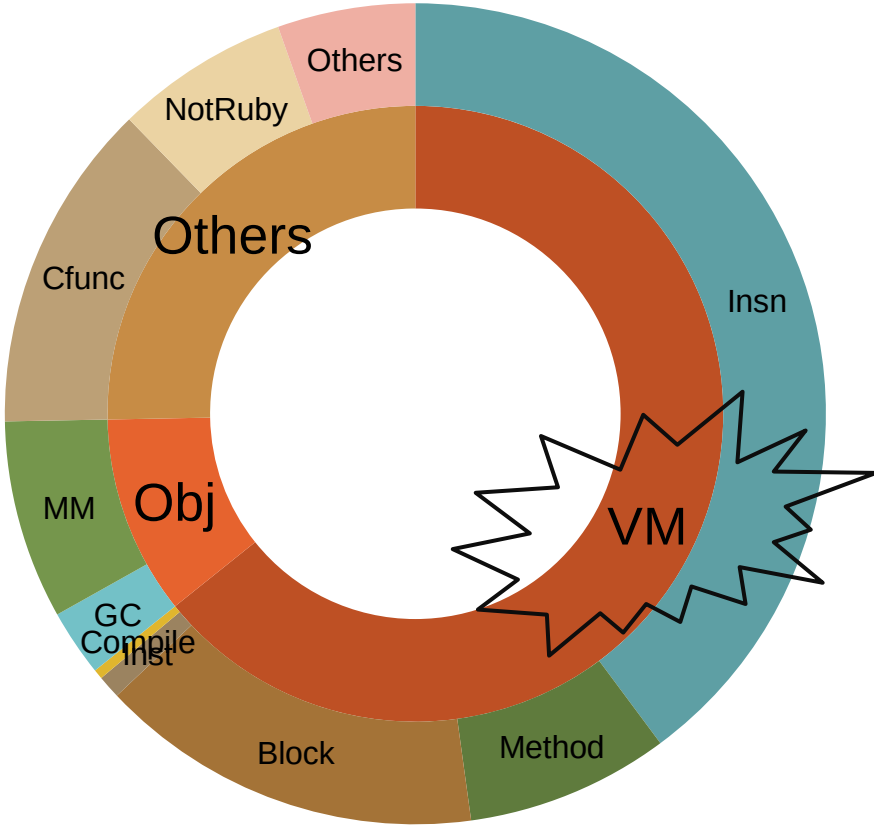
- **VM re-design**
  - **Re-visit Method (control) frame**
  - Re-visit Relationship of **Ruby** and **C**
  - Instruction level re-design
- **Introducing Parallelism**
  - Against **Fine grain** parallelism
  - Against **Coarse grain** parallelism

Easy Performance Analysis (1) Micro benchmark

Fib



Pentomino

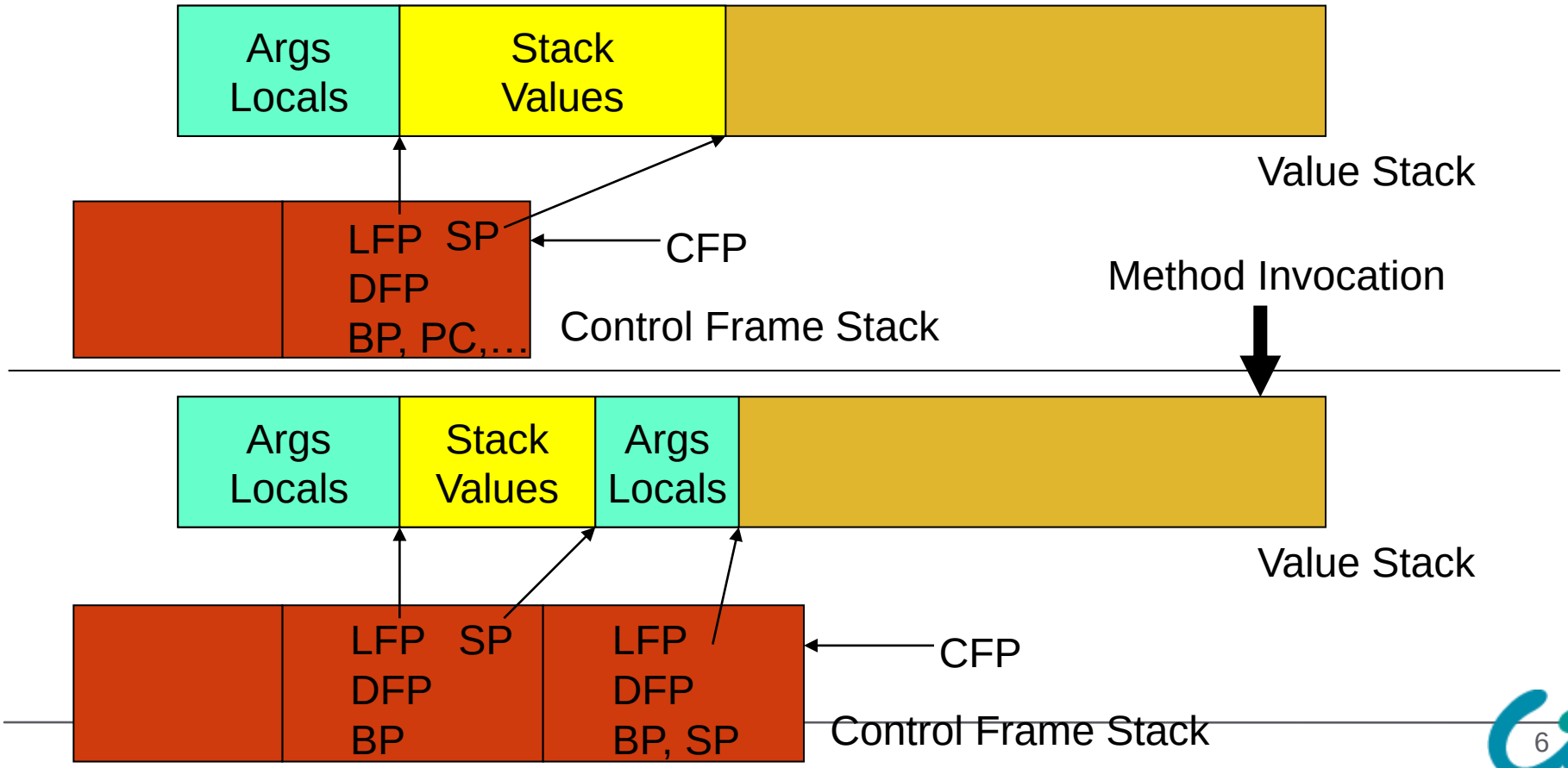


OS: Linux 2.6.31 32-bit
CPU: IntelCore2Quad 2.66GHz
Mem: 4GB
C Compiler: GCC 4.4.1, -O3
Profiled by Oprofile

ruby 1.9.3dev (2010-05-26)
Profiled by Mr. Shiba

VM Re-design
Re-visit Method (control) frame

Current control frame structure



VM Re-design
Re-visit Method (control) frame

- **Too complicated**
- **Too many values to push**

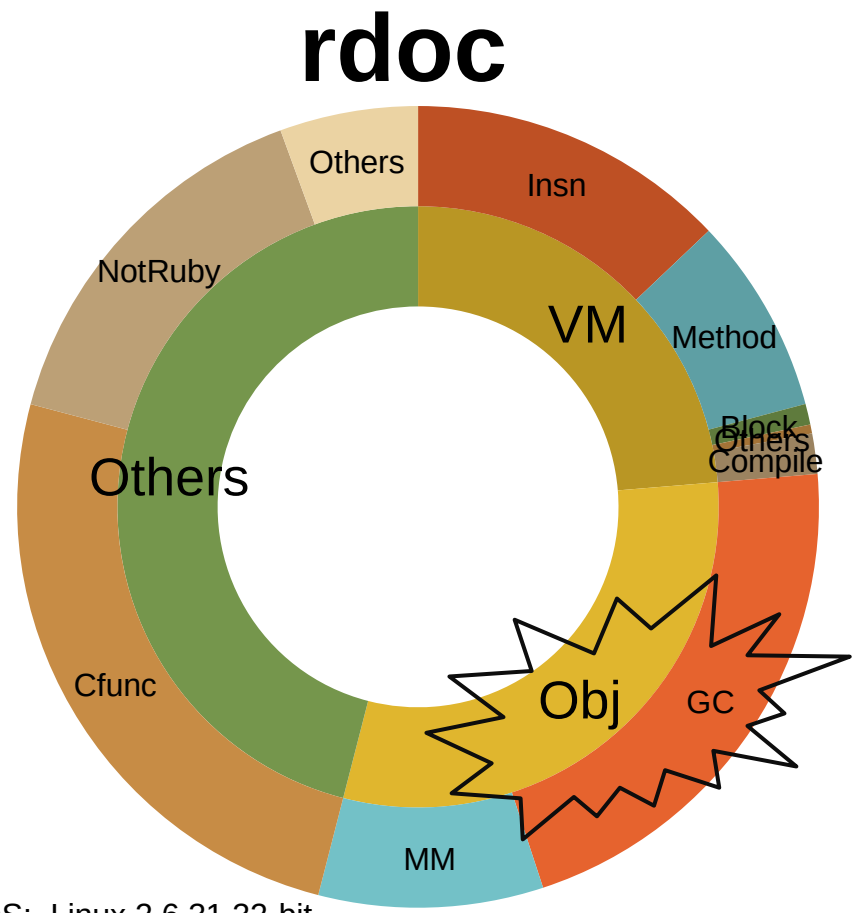
→ **Simplify frame structure**

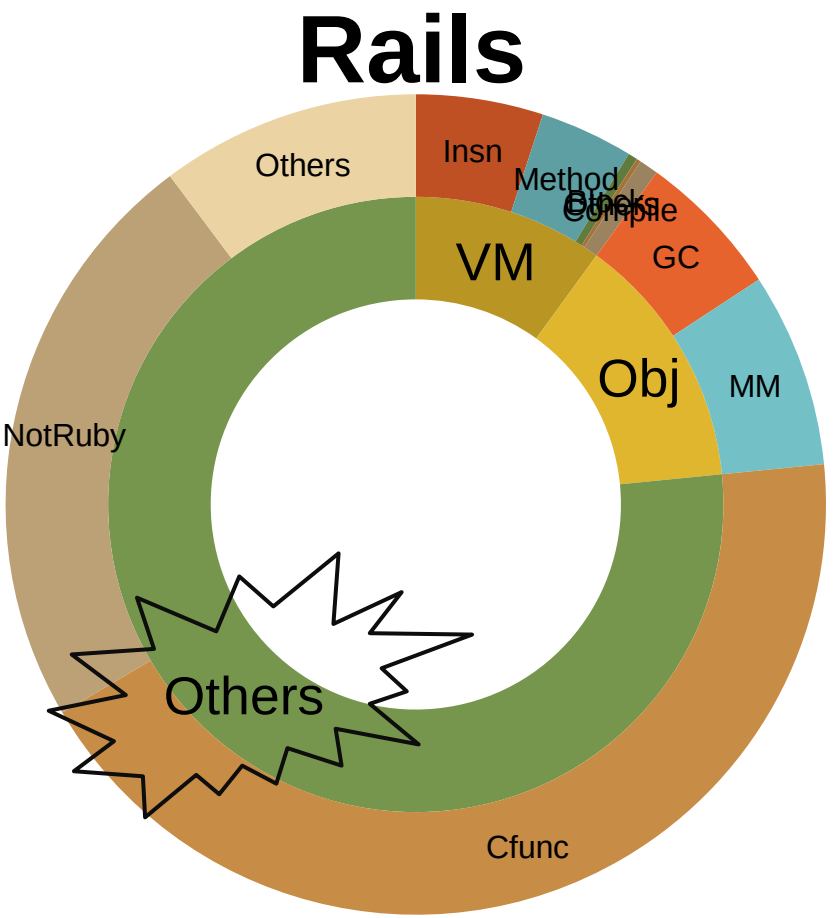
Redesign:

- **VM frame structure**
- **Method data structure**
- **InstructionSequence structure**

	DFP BP	…	DFP / BP, SP	DFP BP

Easy Performance Analysis (2) Macro Benchmark





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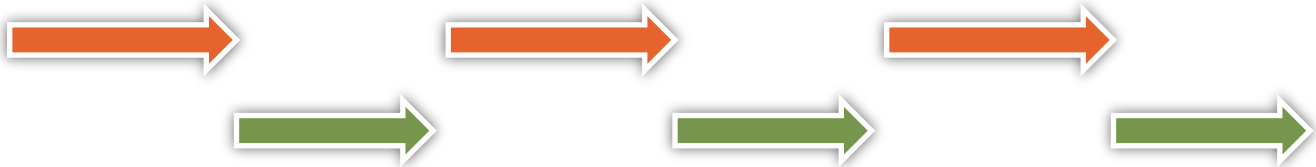
Introduce Parallelism for Multi/Many core era

- **Parallel**, not **concurrent**
  - **Parallel**: run simultaneously
    - Not supported by Ruby

  - **Concurrent**: manage several activity
    - Supported by Ruby's Thread



Introducing Parallelism Principle

NO Parallel Threads in CRuby

I believe parallel threads introduce unhappy result.

Introducing Parallelism
Fine grain parallelism

- Run methods in parallel
  - Time consuming methods
  - Collection of independent methods
- Rubyist should not consider

→ VM run them in parallel auto.

Introducing Parallelism
Fine grain parallelism: Solution

- Write parallel code in C level
  - C extension writer should take difficulties
- Provide **a framework to write parallel C extensions**
- **Now considering specification**

Introducing Parallelism
Coarse grain parallelism: Solution

- **Easy to consider**
- **Separate logic into VMs using MVM (Multiple-VM)**
  - MVM, a.k.a vaporware (やるやる詐欺)
  - VMs run in parallel and lightweight inter-VM communication than inter-process communication
- Similar model as other languages
  - Scala, Erlang, …

Introducing Parallelism Parallel GC

- GC consume time
  → Speedup with Parallel
- Parallel mark
  - I'm not sure about it, however, last day nari-san talk it is considerable
- Parallel sweep
  - Seems easy to support

Request

If you have applications

(1) have performance issues

(2) too slow, give up to run on Ruby

Please ask us.

They will be important reseach materials.

我々の業界ではご褒美です.

Ono more Announcement

- **Escape from Japan** (to UK)
  - Next 2 months
  - I hope **I can concentrate in VM development**
  - To: UK people, please contact me if you have interest about my work
- Stay tuned for next news of VM performance improvement

Summary

We have many Challenges

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Thank you

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RubyKaigi2010 Lightning Talk

Presented by

Koichi Sasada

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This presentation is 1st time about

- English presentation in RubyKaigi
- LT presentation in RubyKaigi
- No joking presentation
- Preparing script